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(54) Apparatus for handling one or more containers

(57) An apparatus for handling one or more containers (C), consisting of a portal-like frame (1) provided with running wheels (3,31) along two parallel sides of the portal, a lifting yoke (9) moveable up and down in the portal and provided with coupling means (11) for the container (C), drive means (14,34) supported by the frame (1) for one or more wheels (3) of the portal and for hoisting the yoke (9), a control system for the drive and

the wheels, wherein the drive means for the wheels and/or hoisting is formed by an electric motor (14,34), wherein a central motor unit (35) with power supply generator (36) for the or each electric motor is placed on top of the portal-like frame (1), whereby good stability, easy operation by the driver and a slimline construction can be achieved.

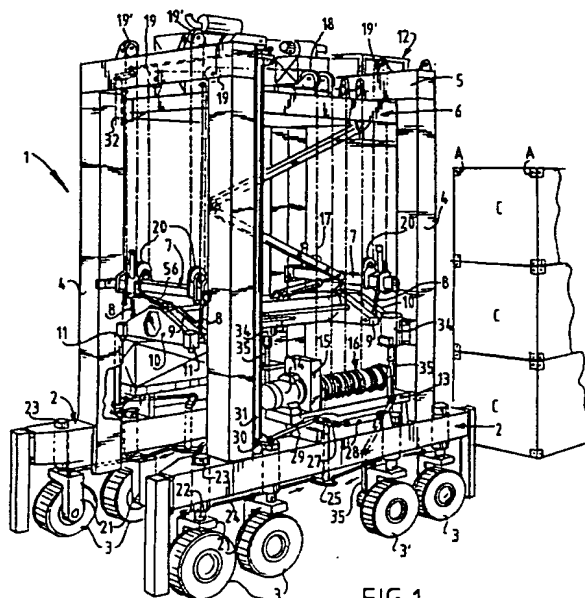


FIG. 1

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## Description

The invention relates to an apparatus for handling one or more containers, consisting of a portal-like frame provided with running wheels along two parallel sides of the portal, a lifting yoke moveable up and down in the portal and provided with coupling means for the container, drive means supported by the frame for one or more wheels of the portal and for hoisting the yoke, a control system for the drive and the wheels.

Such apparatus are known under the name "straddle carrier" and serve for transporting containers over surfaced terrain, for which purpose the apparatus is provided with wheels, wherein the hoisting means serve to hoist up the containers, this to a height such that a container can be transported over at least two containers. Such apparatus are therefore high and travel relatively rapidly for efficient dispatch. This requires a good stability and easy operation for the driver, wherein the apparatus must also take the slimmest possible form in order to enable optimal utilization of storage space.

The invention has for its object to provide an apparatus of the type stated in the preamble which meets the above stated requirements. The apparatus is distinguished in that the drive means for the wheels and/or hoisting is formed by an electric motor, wherein a central motor unit with power supply generator for the or each electric motor is placed on top of the portal-like frame.

Due to the use of electric motors, preferably a three-phase asynchronous motor, which are powered by the generator, an optimal arrangement can be effected for the hoisting operations and the driving of the running wheels. By placing the motor unit and the power supply generator on top of the portal, these elements generally requiring a very large amount of space, the working space of the apparatus is not adversely affected.

According to the invention the control system takes an at least partially electrical form, wherein the power supply thereof is provided by a second generator, which is also supplied by the motor unit. This ensures a separation from the supply to the electric motors, which entails large ratings of for instance 440 kVA, while the control system normally operates with a supply voltage of 24 Volt. No interference thus takes place in the control as a result of disturbances in the mains supply.

According to the invention the control system can also comprise a hydraulic part which serves to adjust the angular position of the or each wheel, the spring-mounting thereof, the brakes and/or the coupling means. This achieves rapid and certain operation during handling of the containers.

According to another feature of the invention each wheel suspension consists of a rotatable plunger which is received in a cylinder and the axis of which runs through the centre of the wheel.

The cylinder enables a hydro-pneumatic spring-mounting which can be controlled separately such that

the most loaded wheels can be given a greater stiffness of the spring-mounting, which increases the stability of the apparatus during transport. In the control of the spring-mounting the outer wheels preferably have the greatest spring stiffness. It is also possible when going through a bend to likewise give the wheels on the outside of the bend a stiffer spring-mounting.

Because of the arrangement of the wheel on the central axis of the plunger, there will be no bending load on the cylinders.

According to the invention a rotation speed limiter can be arranged for the driven wheels in the running wheel assembly, wherein skidding of the driven wheel is prevented when the ground happens to be slippery. It is also possible herein to provide each wheel separately with a brake, for example a disc brake, which is controlled hydraulically.

In order to alleviate the work of the driver it is recommended to arrange the cab, in which the operating system for the control is accommodated above the portal, so that it provides a good view over the work area. The cab can further be provided with a transparent floor. In this cab the invention further proposes to arrange the seat for the driver together with the operating means for rotation round a vertical axis, so that the driver can assume any desired position in the cab, for example for a desired better view, without the cab or the apparatus having to be turned.

In the preferred embodiment the control seat with the operating means is rotatably suspended, preferably electrically, from the ceiling of the cab, whereby the transparent floor remains completely clear.

Above mentioned and other features will be further elucidated in the figure description of an embodiment hereinbelow. In the drawing:

fig. 1 shows a standing perspective view of the apparatus according to the invention,

fig. 2 shows a perspective top view of a part of the upper portal of the apparatus according to the invention,

fig. 3 shows a diagram of the hydraulic control system.

Designated with the numeral 1 is the portal-like frame of the apparatus which is provided with two parallel lower beams 2 under which is arranged a running wheel assembly 3. Placed in each case on the two lower beams are two U-shaped portals which each consist of two vertical legs 4 which lie at a fixed mutual distance and which are joined at the top by a girder 5. The girders are mutually joined at the top by a support construction 6.

A hoisting beam 7, on which a lifting part 9 is suspended by means of chains 8, is moveable up and downward between the legs 4 of each portal by a hoisting gear to be further elucidated.

The lifting part 9 consists of a central portion in which a moveable part 10 is accommodated telescopi-

cally on both sides, the top of which is provided with the coupling means 11 which co-act by means of a rotating movement with the standard coupling means A of a container C on the right in figure 1.

On the side of the apparatus facing the containers a cab 12, which is further elucidated below, is mounted on the upper beam 5 of the right-hand portal.

The hoisting gear for lifting part 9 is placed on the front lower longitudinal beam 2 of the frame between the two portals, which hoisting gear consists of a table 13 on which is placed an electric motor 14. The electric motor 14 is coupled via a brake/gear mechanism 15 to a hoist drum 16. The hoist drum 16 is provided with four winding sections for four cables 17, which are placed over four guide pulleys 18 on the support construction 6. Each cable runs to a corner of the portal to the guide pulley 19 arranged there and is further trained round a return pulley 20 of hoisting beam 7 and transported back to guide pulley 19' on the beam 5 and fastened to hoisting beam 7. Each hoisting beam 7 thus hangs on six cables.

In the embodiment shown each wheel 3 is rotatably mounted in the vertical arm of an L-shaped wheel support 21. The short leg of the L-shaped wheel support 21 is fixedly mounted on a plunger 22 of a cylinder 23 which is received vertically in lower beam 2. The plunger with the cylinder 23 thus forms a swivel pin for controlling the wheel 3. In order to enable control of the wheels each L-shaped wheel support 21 is coupled to a control rod 24 which leads to a lower arm 25 of a vertically standing coupling rod 26 in the lower longitudinal beam 2. This coupling rod 26 is provided with an arm 27 which is pivotally coupled at one end to the piston rod of a cylinder 28. The cylinder 28 is supplied by the hydraulic control system. The other end of the upper arm 27 leads with a control rod 29 to an arm 30 of a rotating rod 31 which lies vertically adjacent to the post 4 and which is connected via a similar system to a control rod 32 lying on the other side, which is coupled to a control system arranged on the other side which corresponds with the control system as described above. In this manner all wheels can be controlled with one hydraulic control cylinder 28, this such that by correct positioning of the swivel pins, dimensioning of the control arms etc., all wheels acquire the suitable deflection such that the wheel axle intersects the virtual rotation centre of the bend.

Arranged on the inside of each leg 4 of the right-hand portal is an electric motor 34 which drives the wheel 3' via a drive rod assembly 35. The actuation of the electric motor 34 is such that it can be limited as soon as wheel 3' skids on account of slipperiness.

Fig. 2 shows that on top of the portal-like frame 1, in particular on top of the support frame 6, is placed the motor unit 35 which can consist for instance of a diesel motor. Via a suitable transmission the diesel motor drives a main generator 36. This main generator 36 serves to power the electric motor 14 for the hoisting gear and the electric motor 34 for driving the running

wheels 3'.

The motor unit 35 is also provided with a dynamo 37, which provides the feed for the electric control system. The control and the power supply are thereby arranged in the apparatus separately of each other.

Designated by numeral 39 is the pump housing which is driven by an electric motor 38 which is likewise powered by the generator 36. The pump housing 39 comprises pumps of the hydraulic control system. If desired, these pumps 39 can be driven directly by the motor unit 35.

According to a particular feature of the invention, the control cab 40 is arranged on the top end of the portal 1, and is mounted in fig. 2 on the upper beam 5. The control cab is provided on at least three sides with windows, wherein the floor is likewise made of transparent material such that the driver, who is seated in the driver's seat 41, has a view on all sides.

The seat 41 is incorporated in a rotatable frame 42, for which purpose a rotating assembly 43 is arranged on the ceiling of cab 40. The operating means, which consist of pedals 44, a button panel 45 and a steering wheel 46, are also arranged in the rotatable frame 42, so that the driver always has the operating means within reach. Meters can optionally be accommodated in the panel 48 on the upper side of the rotatable frame 42.

The driver therefore not only has an all-round view but also a direct view of the meters and direct access to the operating means.

The hydraulic control diagram is shown in figure 3. This hydraulic system is divided into two parts and consists of a left-hand part, of which the pump 50 energizes the control cylinder 28 via a suitable conduit system and valve system. The valve system is operated by the steering wheel 46 in the cab 40. The pump 50 is accommodated in the pump unit 39.

The pump 50 also feeds the cylinders and coupling means 11 of the lifting yoke 9. The coupling means are the known "twist locks", which fit on the standard coupling eyes of a container. The cylinders 54 are also powered for respectively lengthening or shortening the lifting yoke by extending the end piece 10 relative to the central part 9. Cylinders 56 and 57 are arranged between the central part 9 of the lifting yoke and the associated hoist beam 7 to enable placing of the lifting yoke at a slant relative to the longitudinal axis of the apparatus in order to get the coupling means into the correct position relative to a container.

A second pump 51 feeds the conduits to the brake claws 52 on one side which are situated on the wheel support 21, wherein the disc is fixed to the wheels 3 themselves. The pump 51 further provides the pressure in the cylinders 23 of each wheel 3, this such that the pressure can be adjusted by a suitable valve system depending on the load on the wheel. Spring-mounting of the wheel is provided by an air vessel 53. The stiffness of the spring-mounting is determined by adjusting the hydraulic pressure in the spring system.

It will be apparent from the above that the driver can

control all functions of the apparatus from the cab, wherein he can adopt an optimal position relative to the apparatus. Due to the hydro-pneumatic spring-mounting the apparatus can be held very stable, which can be enhanced by a stability system, wherein the spring-mounting of the wheels becomes stiffer the faster there is driven, the higher the container hangs in the construction and the greater the weight of the container. In a bend the outer wheels can have a stiffer spring-mounting, during braking the front wheels in the direction of forward movement and during acceleration the rear wheels.

Due to the use of electro-hydraulic control and the electrical drive with associated electronics and valve system a very safe and effective control program can be realized.

The invention is not limited to the above described embodiment.

#### Claims

1. Apparatus for handling one or more containers, consisting of a portal-like frame provided with running wheels along two parallel sides of the portal, a lifting yoke moveable up and down in the portal and provided with coupling means for the container, drive means supported by the frame for one or more wheels of the portal and for hoisting the yoke, a control system for the drive and the wheels, characterized in that the drive means for the wheels and/or hoisting is formed by an electric motor, wherein a central motor unit with power supply generator for the or each electric motor is placed on top of the portal-like frame.
2. Apparatus as claimed in claim 1, characterized in that the control system takes an at least partially electrical form, being fed by another power supply generator driven by the motor unit.
3. Apparatus as claimed in claims 1 and 2, characterized in that the control system also comprises a hydraulic part for adjusting the angular position of the or each wheel, the spring-mounting thereof, the brakes and/or the coupling means.
4. Apparatus as claimed in claim 3, characterized in that the hydraulic part is divided into two separate sections.
5. Apparatus as claimed in claims 1-4, characterized in that each wheel suspension consists of a rotatable plunger which is received in a cylinder and the axis of which runs through the centre of the wheel.
6. Apparatus as claimed in claim 5, characterized in that the spring-mounting of each wheel is hydro-pneumatic and the hardness of the spring-mounting is separately adjustable by the control.

7. Apparatus as claimed in any of the foregoing claims, characterized in that the driven wheels have a speed limiter.

8. Apparatus as claimed in claim 1, wherein the operating system for the control is accommodated in a cab, characterized in that the cab is arranged on top of the portal and is provided with a transparent floor.

9. Apparatus as claimed in claim 8, characterized in that in the cab a preferably electrically driven seat with operating means is arranged for rotation round a vertical axis.

10. Apparatus as claimed in claim 9, characterized in that the rotatable control seat is suspended with the operating means from the ceiling of the cab.

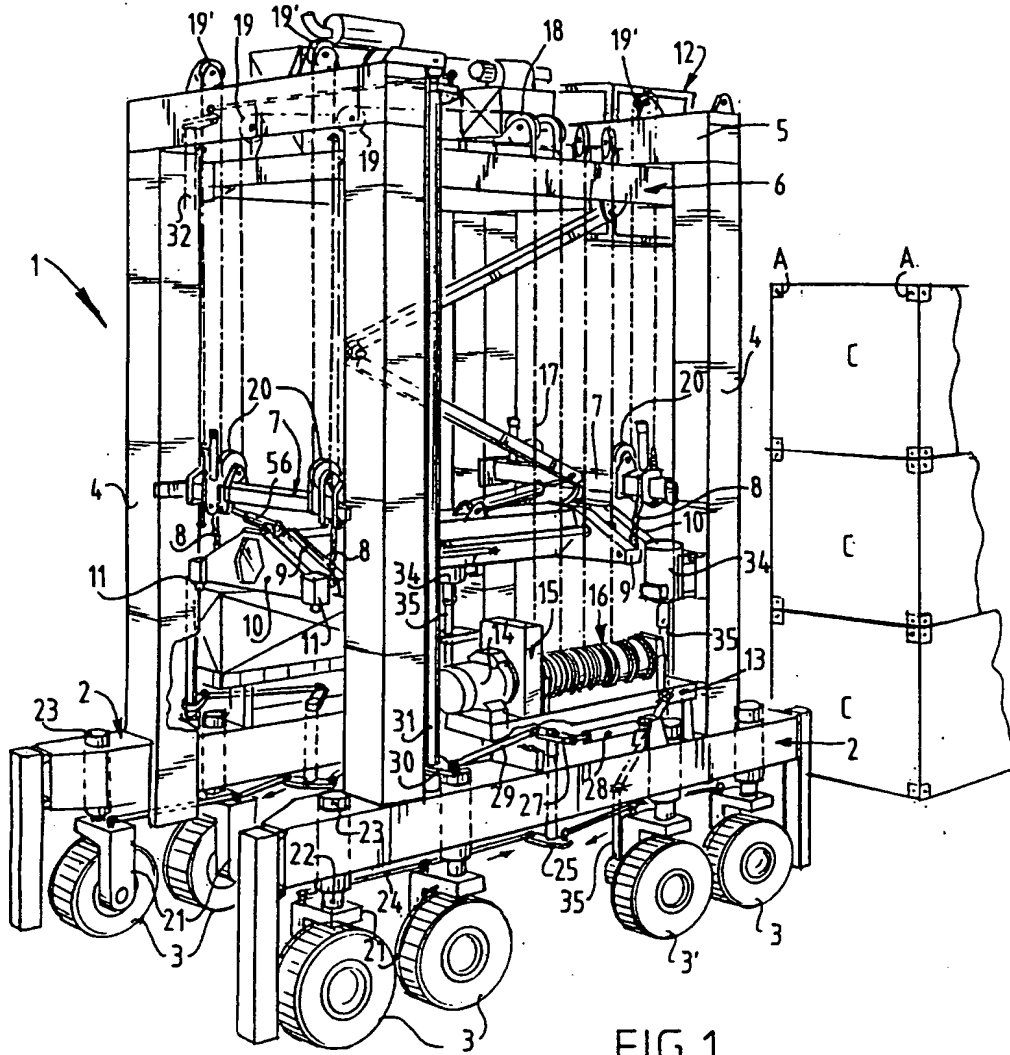


FIG. 1

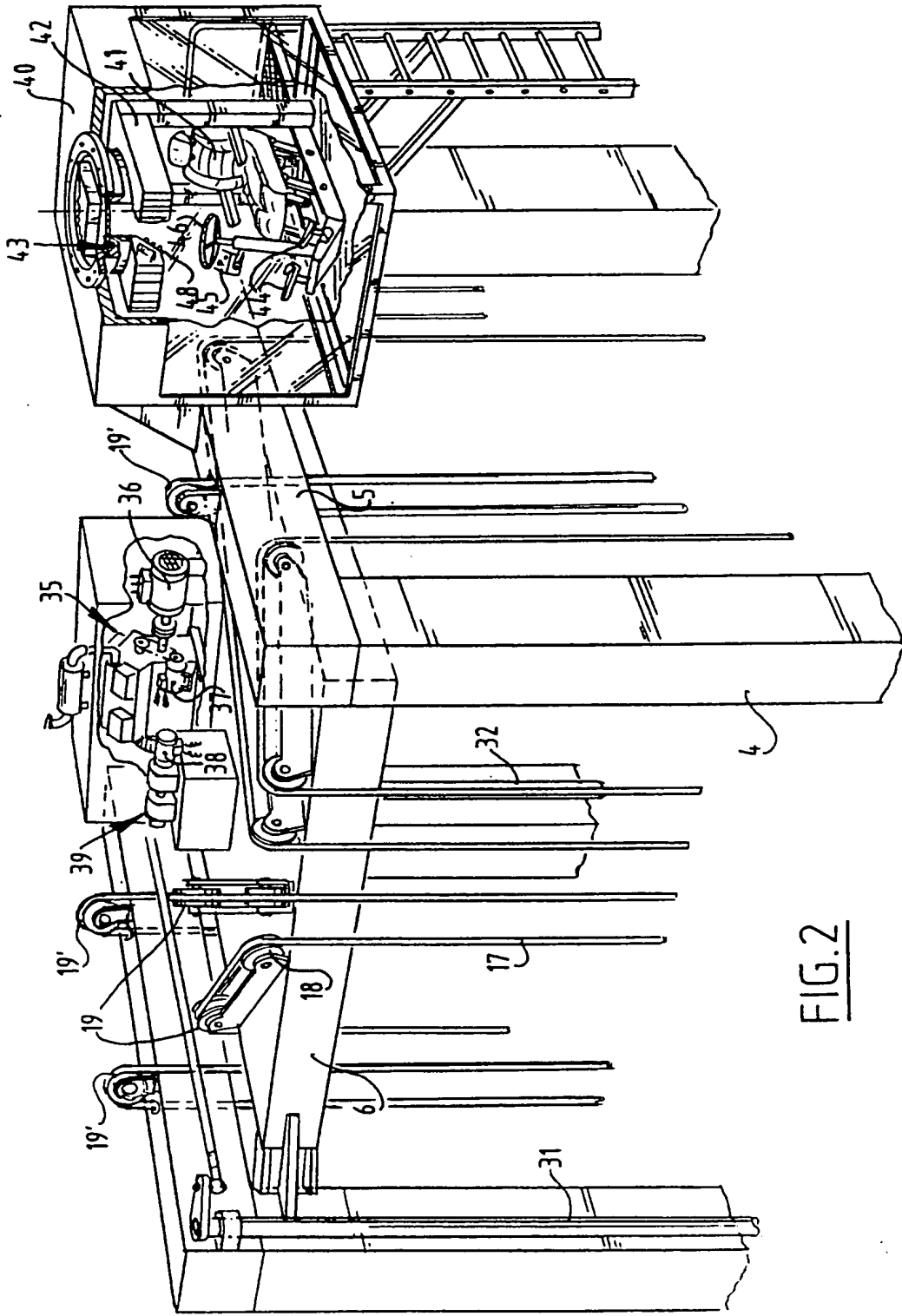
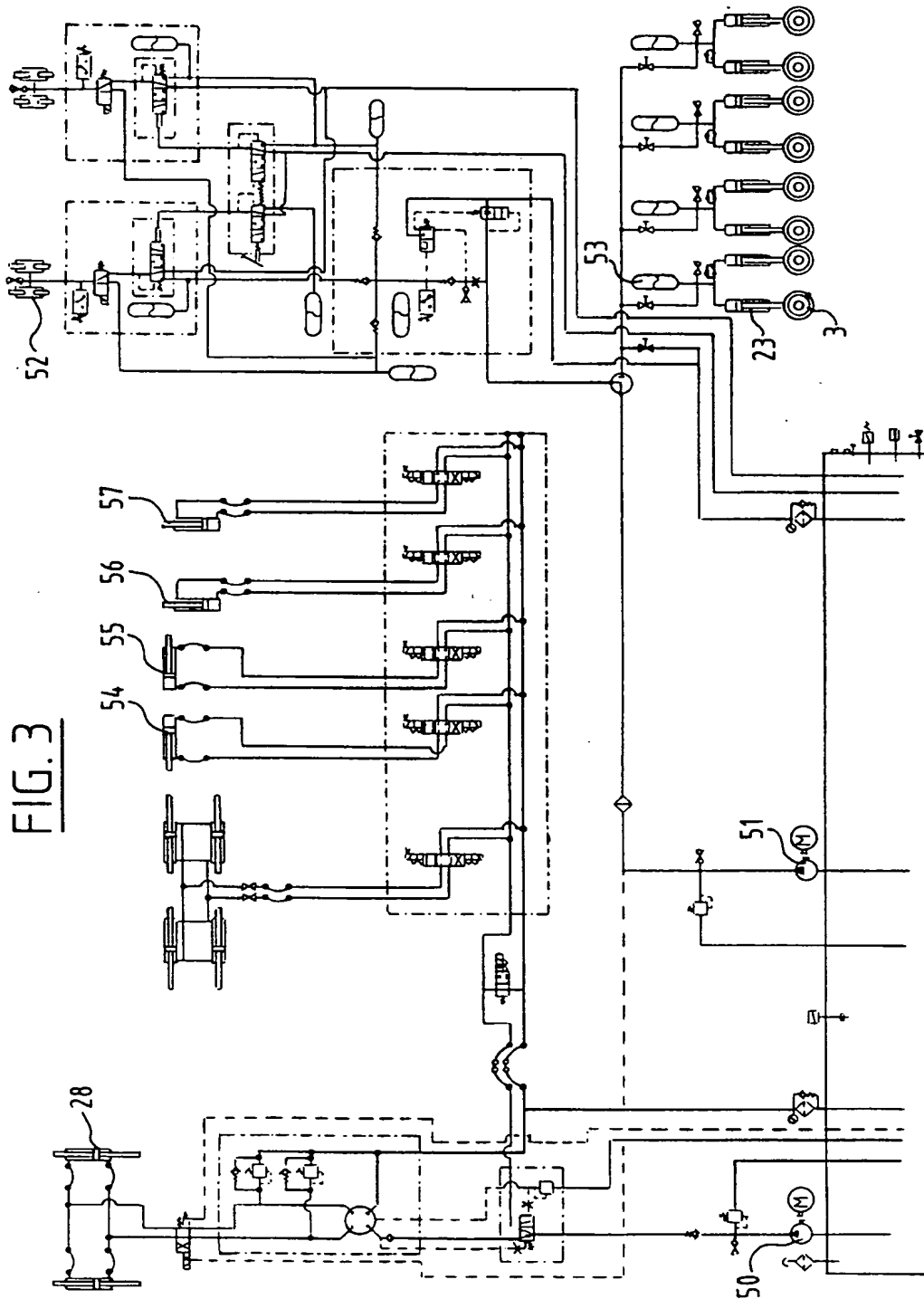


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number

EP 96 20 2378

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	US-A-4 599 030 (SKAÅLEN)	1-3	B66C19/00
A	* the whole document *	8	B66C13/54
Y	DE-A-34 29 098 (HITACHI)	1-3	
A	* the whole document *	8	
A	US-A-4 432 690 (MONK)	5,6	
	* column 3, line 33 - column 4, line 59 *		
A	DE-B-12 78 347 (FRIEDRICH KOCKS)		
A	DE-A-16 55 257 (TAX)		
A	DE-A-19 51 145 (JÜNKERATHER MASCHINENBAU)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B66C B66F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		16 December 1996	Van den Berghe, E
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